

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

Amendments to the Claims:

This listing will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently amended): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide, said method comprising the steps of:

a) ~~providing~~ receiving a hot gas stream from a source thereof, metal or metal waste processing system, said hot gas stream comprising a desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide; halide and being at a temperature at which the desired metal oxide, and each of the at least one of an additional volatile metal/metal oxide and metal halide are all in the form of vapors;

b) providing a mechanical separation device for separating any solids from said hot gas stream;

c) feeding the hot gas stream into the mechanical separation device at a temperature that is less than the boiling temperature of the desired metal oxide and greater than the boiling temperature of ~~the at least one additional volatile metal/metal oxide and metal halide present in~~ remaining components of the gas stream so as to separate the desired metal oxide from the at

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

~~least one additional volatile metal/metal oxide and metal halide present in remaining components~~
of the gas stream; stream as a product having relatively few impurities; and

d) collecting the separated desired metal oxide.

Claim 2 (Original): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein in step a) the hot gas stream comprises a volatile metal which is oxidized to form the desired metal oxide that is separated in step c).

Claim 3 (Original): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 2, wherein a source of oxygen is added to the hot gas stream to form the desired metal oxide that is separated in step c).

Claim 4 (Currently amended): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the metal oxide that is separated in step c) ~~comprises~~ is zinc oxide.

Claim 5 (Original): A method for removing a desired metal oxide from a hot gas stream that

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the hot gas stream is provided from a furnace.

Claim 6 (Original): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator and a mechanical filter.

Claim 7 (Original): A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the additional volatile metal/metal oxide comprises a halide compound.

Claim 8 (Currently amended): A method of recovering a volatile metal from a metal processing feed which comprises the steps of:

- a) providing a metal processing apparatus in which metal mixtures can be heat processed;
- b) feeding into the metal processing apparatus a mixture of volatile metals and metal compounds together with a reductant capable of reducing metal compounds to pure metals;
- c) heating the contents of the metal processing apparatus to cause volatile materials to

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

vaporize and form a released gaseous mixture including a desired volatile metal component;

d) removing the released gaseous mixture from metal processing apparatus;

d) e) feeding the released gaseous mixture into a mechanical separation ~~device~~; device at a temperature that is less than the boiling temperature of the desired metal component and greater than the boiling temperature of remaining components of the gaseous mixture so as to separate the desired metal component from the remaining components of the gaseous mixture as a product having relatively few impurities;

e) separating the ~~desired volatile metal component from the remaining portion of the released gaseous mixture~~; and

f) collecting the separated desired volatile metal component.

Claim 9 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mixture of volatile metals and metal compounds comprises a first feed that contains the desired volatile metal component and a second feed that contains the reductant.

Claim 10 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 9, wherein the mixture of volatile metals and metal compounds further comprises an additional feed of an iron-containing material.

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

Claim 11 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 10, wherein the iron-containing material comprises at least one of scrap iron, iron ore, sinter dust and basic oxygen furnace sludge.

Claim 12 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 9, wherein the first feed comprises electric arc furnace dust.

Claim 13 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the reductant comprises a carbon source.

Claim 14 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 13, wherein the carbon source comprises coke.

Claim 15 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the metal processing apparatus comprises a furnace.

Claim 16 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 15, wherein the metal processing apparatus comprises at least one of an induction furnace, an open hearth furnace, a rotary kiln, a tunnel kiln and a rotary hearth furnace.

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

Claim 17 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator and a mechanical filter.

Claim 18 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein a source of oxygen is combined with the released gaseous mixture to oxidize the desired volatile metal component before step e).

Claim 19 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the desired volatile metal component comprises zinc.

Claim 20 (Original): A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mixture of volatile metals and metal compounds comprise a halide compound.

Claim 21 (Currently amended): A method of recovering zinc from electric arc furnace dust which comprises the steps of:

- a) combining electric arc furnace dust with at least a reductant capable of reducing zinc oxide to zinc in a thermal processing apparatus;
- b) heating the thermal processing apparatus to cause reduced zinc oxide to vaporize

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

together with other volatile ~~components~~; components and form a gaseous stream

c) oxidizing the vaporized ~~zinc~~; zinc in the gaseous stream to form zinc oxide;

d) feeding the gaseous stream into a mechanical separation device at a temperature that is less than the boiling temperature of the zinc oxide and greater than the boiling temperature of remaining components of the gaseous stream so as to separate the zinc oxide from the remaining components of the gaseous mixture as a product having relatively few impurities;

~~oxidized zinc and other volatile components into a mechanical separation device capable of separating the oxidized zinc from the other volatile components; and~~

e) collecting the separated ~~oxidized zinc~~; zinc oxide.

Claim 22 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein in step a) the electric arc furnace dust is further combined with an iron-containing material.

Claim 23 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the iron-containing material comprises at least one of scrap iron, iron ore, sinter dust and basic oxygen furnace sludge.

Claim 24 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein a source of oxygen is added to the zinc vapor in step c) to oxidize the zinc

Appl. No. 10/608,351
Amdt. Dated January 17, 2005
Reply to Office Action of November 10, 2004

vapor.

Claim 25 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator and a mechanical filter.

Claim 26 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the thermal processing apparatus comprises at least one of an induction furnace, an open hearth furnace, a rotary kiln, a tunnel kiln and a rotary hearth furnace.

Claim 27 (Original): A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the collected zinc oxide is further processed to obtain purified zinc.